THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte ROBERT R. ALFANO,
KWONG M. YOO, SAMIR AHMED,
ZHI-WEI ZANG AND FENG LIU

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Appeal No. 95-3911
Application 08/189,124[1]

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ON BRIEF

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Before HAIRSTON, KRASS, and TORCZON, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

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[1] Application for patent filed January 28, 1994. According to applicants, the application is a continuation of Application 07/927,566, filed August 10, 1992.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1 through 4 and 6 through 8.

The disclosed invention relates to a method and apparatus for imaging a luminescent object in or behind a scattering medium. The method and apparatus include means (i.e., an absorbing dye) added to the scattering medium for making the scattering medium preferentially absorbing of luminescent light emitted by the object. As a direct result of the means added to the scattering medium, the multiple scattered component of the luminescent light is absorbed by the scattering medium as compared to the ballistic (i.e., unscattered) component of the luminescent light.

Claim 1 is illustrative of the claimed invention, and it reads as follows:

1. A method for imaging an object in or behind a scattering medium comprising the steps of:

(a) making the object to be detected luminescent;

(b) illuminating the object through the scattering medium with a beam of illuminating light, the illuminating light being of a sufficient wavelength to cause the object to luminesce;

(c) whereby luminescent light is emitted from the object

into the scattering medium, the luminescent light comprising a ballistic component and a multiple scattered component;

(d) making the scattering medium preferentially absorbing of the luminescent light emitted by the object so that the multiple scattered component of the luminescent light is preferentially absorbed by the scattering medium as compared to the ballistic component of the luminescent light;

(e) filtering out illuminating light from light emergent from the scattering medium; and

(f) forming an image of the filtered light.

The references relied on by the examiner are:

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| Modell | 5,022,757 | June 11, 1991 |
| Makino et al. (Makino) | 5,097,135 | Mar. 17, 1992 |
| Yoo et al. (Yoo) | 5,140,463 | Aug. 18, 1992 |

(filed Mar. 8, 1990)

Claims 1 through 4 and 6 through 8 stand rejected under 35 U.S.C. § 103 as being unpatentable over Makino in view of Yoo.

Claims 1 through 4 and 6 through 8 stand rejected under 35 U.S.C. § 103 as being unpatentable over Modell in view of Yoo.

Reference is made to the briefs and the answer for the respective positions of the appellants and the examiner.

OPINION

We have carefully considered the entire record before us, and we will reverse the obviousness rejections of claims 1 through 4 and 6 through 8.

Makino discloses a fluorescent microscope system (Figures 6 and 7) that uses fluorescence to determine a calcium concentration in a sample cell 10. A fluorescent probe (e.g., fura-2) is administered to the sample cell 10, and the sample cell 10 then emits fluorescence light by radiation of the excitation light from illumination apparatus 1 (column 8, lines 7 through 19). The fluorescence light is analyzed to determine the calcium concentration (column 8, lines 20 through 23; column 10, lines 32 through 34). A printer 17 produces a hard copy of color image data, a computer 15 stores the color image data, and monitor 16 provides a view of the color image data (column 10, lines 27 through 35).

Modell discloses a system and method for sensing a target substance within a tumor 86 (Figure 2). A photodynamic sensitizer (e.g., a dye such as hematoporphin derivative (HPD)) is injected into the area where the tumor is located. When the area is irradiated with light, the higher concentrations of photodynamic sensitizer within the malignant

tissue exhibit a fluorescence at a color substantially different from the light pink appearance of normal tissue. Optical equipment and techniques are used to measure this fluorescence.

In summary, both Makino and Modell sense fluorescent light emitted from an object in a sample cell. The examiner recognizes (Answer, pages 3 and 4) that Makino and Modell use a "backscattering geometry" as opposed to a "transmission geometry" as disclosed and claimed by appellants. Appellants have not challenged the examiner's conclusion (Answer, pages 3 and 4) that it would have been obvious to one of ordinary skill in the art to use a "transmission geometry" in both Makino and Modell in lieu of the "backscattering geometry."

Yoo discloses techniques for improving the signal-to-noise ratio of an image formed of an object hidden in or behind a semi-opaque random media. In the disclosed techniques, the ballistic or unscattered portion of a pulse is the signal, and the scattered portion of the pulse is the noise. One of the techniques disclosed by Yoo involves the introduction of an absorbing dye into a random medium to reduce the noise or multiple scattered light (column 8, lines

47 through 53). According to Yoo (column 8, line 67 through column 9, line 2), "the introduction of a dye into a random medium will preferentially absorb the multiple scattered light component over the ballistic portion."

Based upon the absorption teachings of Yoo, the examiner is of the opinion that it would have been obvious to one of ordinary skill in the art to provide that the scattering medium cell of Makino and the scattering medium tissue in Modell "absorb the luminescent emission" of the object in view of the "improved imaging through the suppression of scattered light components as suggested by Yoo *et al*" (Answer, pages 3 and 4). In response to appellants' arguments in the brief, the examiner concludes (Answer, page 5) that "[a]ppellant[s] can point to no physical reason why the absorptive quality of a dye would cease if the light were a fluorescent emission rather than a reflection or scattering."

In response, appellants argue (Reply Brief, pages 1 and 2) that:

> Appellants respectfully disagree with the Examiner's assertion that the absorptive quality of a dye would be unaffected if the light to be absorbed were a fluorescent emission rather than a reflection or scattering of illuminating light. As apparently

> noted by the Examiner, the absorbing dye of Yoo et al. preferentially absorbs light of the illuminating wavelength and not of the fluorescing wavelength. Accordingly, the absorbing dye of Yoo et al. could not be used and was not used in the present invention since it does not preferentially absorb light of the fluorescing wavelength. Therefore, as can readily be seen, to arrive at the claimed invention using Makino et al. or Modell and Yoo et al., one must take several inferential leaps which are neither taught nor suggested by the prior art, not the least of which is that the disclosure in Yoo et al. of a dye that absorbs illuminating light renders obvious the use of a dye that absorbs fluorescing light, especially where no need for a dye that absorbs fluorescing light is apparent from Makino et al. or Modell.

We agree with appellants' arguments. To establish a prima facie case of obviousness, the examiner has the initial burden of demonstrating by evidence or a convincing line of reasoning why the absorptive dye in Yoo would absorb a fluorescent light in addition to the scattered or reflected light (Answer, page 5). In the absence of such evidence in the record or a convincing line of reasoning by the examiner, the burden is not on the appellants to prove that the dye used in Yoo will not absorb fluorescent light. Consequently, the obviousness rejections are reversed.

## DECISION

The decision of the examiner rejecting claims 1 through 4

and 6 through 8 under 35 U.S.C. § 103 is reversed.

REVERSED

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| KENNETH W. HAIRSTON<br>Administrative Patent Judge | ) | |
| ERROL A. KRASS<br>Administrative Patent Judge | ) | BOARD OF PATENT APPEALS AND INTERFERENCES |
| RICHARD TORCZON<br>Administrative Patent Judge | ) | |

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